UNITED STATES BANKRUPTCY COURT
SOUTHERN DISTRICT OF NEWYORK

Case No. 05-44481 (RDD)

RESPONSE

1. Claim Number: 7907

2. Name of the Claimant: Yilmaz Sahinkaya; Structural Mechanics Analysis, Inc (SMA).

3. Claim Amount : $ 42,400 for completing 80% of the work products described in the Statement of work (SOW) for the Delphi P.O. AES 93504.

4. Basis for reversing the disallowance and expunging of Claimant's claim due to the Fifth Omnibus Objection as "Untimely Insufficient Documentation." SMA had provided Delphi with the work products at the highest possible speed and quality while satisfying all of the requirements in the Statement of work (SOW). SMA had completed 80 % of the work products described in the SOW for the Delphi P.O. AES 93504 and the total work product stands as a deliverable for the reasons given below.

1) Attachment-1 exhibits a copy of the Delphi P.O. AES 93504 was given to SMA on July 2, 1999. The project cost was estimated under the assumptions as shown below.

a) Work type : Modeling, simulation, validation, documentation and training as related to the development of the integrated system modeling and simulation program of the electrical system for 42/14 volt vehicles.

b) Project completion time: 6 months

c) Estimated labor cost: $ 110,000 for 1100 hours of work at the labor rate of $100 /hour.

d) Travel cost: $10,000 for 5 trips between San Francisco, CA and Kokoma, IN. The addition of the above costs in b, c, and d yields a total cost of $120,000.

2) Attachment- 2 shows a memo written by Dr. John MacBain, the Delphi project team leader to announce the agenda of the project kick-off meeting which was held in Kokoma on August 16-18,1999. At the end of the kick-off meeting, the following decisions have been made by Mr. James Wood, the Delphi manager supervising this project:

a) Provide SMA with the required alternator and battery test data to develop a leading-edge computer modeling and simulation program for the electrical system for 42/14 volt vehicles and adaptable to conventional vehicles. The SMA technical team leader Dr. Yilmaz Sahinkaya working with Dr. Iftikhar Khan of Delphi had proposed the development of a computer modeling and simulation program including the alternator with the voltage regulator, three phase bridge rectifier, and dual batteries having interaction dynamics which involve nonlinear behavior and closed-loop control operation.

b) Identification of the Delphi engineers to supply the required design and test data to SMA to achieve the work described in the statement of work (SOW) with 4 tasks as shown on the P.O. statement enclosed in Attachment-1.

c) The primary goal is the development of an integrated system modeling and simulation program for the analysis of the electrical system for 42 / 14 volt vehicles to satisfy the SOW requirements as defined in " a " above.

d) Project completion date is not available (NA), since the test data required to model the nonlinear characteristics for the sub systems including alternator and batteries were not available and had to be prepared by Delphi engineers. SMA 's data collection work had begun on August 16, 1999 and continued until March 20, 2000 as indicated in Attachment-2 below.

3) Attachment-3 exhibits the delivery dates of the required design data set and test data set for the alternator model. These data sets were delivered from Delphi to SMA over a delay period of 2.5 and 6 months, respectively after the end of the project kick off meeting in Kokoma on August 16-18, 1999. But, these crucial test data sets were excellent in quality and included the right information to aid in the development of an unique mathematical model for the three-phase power circuits of the alternator and the delta-type bridge rectifier and the single-phase power circuit of the alternator field whose current amplitude is regulated by the closed-loop controller action of the voltage regulator to generate a specific DC bus voltage after the cold weather starter operations. Attachment-3 includes:

a) The machine parameter data set for the alternator supplied by Ron Krefta of Delphi to Yilmaz Sahinkaya of SMA, dated November 9, 1999.

b) The alternator dynamic test data set supplied by Ron Krefta of Delphi to the Delphi Technical Team and SMA, dated March 20, 2000.

It must be stated that the alternator model is the heart of the electrical system of the 42/14 volt vehicle. It does not take a rocket scientist to figure out that a time delay of 6 months in the delivery of the crucial alternator test data in addition an expected work duration of 6 months will yield a project completion time of one year. This is roughly the time it took SMA to complete 80 % of the project. Thus, the SMA respectively rejects the term of " Untimely... " for the work delivered to Delphi. This is because, Delphi manager Mr. James Wood knew that the test data to be prepared by Ron Krefta was going to take at-least 6 months after the kick-off meeting on August 16-19, 1999. Therefore, he knew very well that the required 6-months of the project completion time by SMA was not possible. An appropriate action by Delphi would have been the termination of the P.O. after the kickoff meeting on August 16-18, 1999. But, instead of such an acceptable Action, he gave SMA the green light to work on the project as stated on the SOW with no specific completion date was demanded in any form from the SMA team.

4) Attachment-4 exhibits the total work products delivered to Delphi. On the first page of the computer listing for each program, the lines underlined in red show:

a) Subsystem or system title for each program.

b) Program completion date which was also the mailing date of the related work product to Dr. John Mac Bain, the Delphi project team leader.

c) The names of the Delphi engineers who have made contributions during the data collection.

The total SMA work products delivered to Delphi are shown in Table-1. The list includes four stand-alone subsystem programs and 1 integrated system program. All five- programs include nonlinear component characteristics and closed -loop control system operations like in

the real-world operations. The close agreement between the simulation results and test results for each program shows that all 5 programs satisfy the SOW requirements. Note that, all 5 programs delivered to Delphi had been written in CSSL-IV language, but can be easily converted to other computer languages like ACSL, MATLAB/ Simulink, and Saber.

Table-1. The CSSL-IV / ACSL / MATLAB / Simulink
Modeling and Simulation Program Cost Estimation

Model	Lines of Code	Rate ($/line)	Cost ($)	Completion Date
1) DC-DC Buck Voltage Converter Subsystem	106	55	5,830	09/11/99
2) The 42 Volt Lithium Polymer Battery Subsystem	380	55	20,900	03/31/00
3) The 14 Volt Lead Acid Battery Subsystem	240	55	13,200	04/05/00
4) Alternator Subsystem	720	85	60,350	07/26/00
5) 42 / 14 Volt Automotive Electrical System	900	85	76,500	09/07/00
	Total Estimated Cost * : $ 176, 780			

* = Does not include travel cost.

The Table-1 above shows the program costs estimated by means of an empirical formula supplied by Dr. Ragnar Nilsen, the CSSL-IV owner, in Chatsworth, CA with 40 years of experience in system modeling and simulation, computers, and control systems. The CSSL language is an English- like programming language that shows a close- resemblance between the program statements and the model expressions representing the physical and operational characteristics of a system. Therefore, it is a routine job to convert a CSSL-IV based program into an ACSL or MATLAB / Simulink based program. The conversion of the main CSSL – IV program into an equivalent Saber program for the electrical system of the 42 /14 volt vehicles and the presentation of the 5-day workshop training course for the Delphi engineers as required by the SOW of the project were not achieved. This was caused by the unilateral termination of the project by Delphi. The estimated cost of the project was determined by the SMA management to be $196,870 and can be itemized as shown below.

a) The labor cost for Dr. Yilmaz Sahinkaya was computed by multiplying 80 % of the actual labor of 2240 hours at a labor rate of $100 /hour during the time from August 16, 1999 to September 14, 2000 as shown below.

0.80 x 2,240 hours x $ 100/hour = $ 179, 200.00

This is close to the project cost of $ 176,780 as shown in Table-1 above.

b) Four trips from San Francisco, CA to Kokoma, IN and Flint, MI at a cost of $10,000 (4 trips at $ 2,500 / trip).

c) The consultation cost for Altan Eris during the project schedule was $ 7,670 as shown in Attachment-9.

d) Thus, the cost estimation for this project can be determined by summing the costs in a, b, and c above as follows:

$ (179,200 + 10, 000 + 7,670) = $ 196,870

It is clear that, the total work products delivered from SMA to Delphi should satisfy the quantity and quality requirements for the SOW. Thus, SMA rejects the term of "...Insufficient Documentation " without a shred of doubt on the basis of the documentation presented in Attachment-4.

5) Attachment-5 exhibits the first SMA invoice for $ 32,000 for the project work completed between August 15, 1999 and April 28, 2000.The estimation of the first SMA invoice payment was computed in proportion to the percent of each task of the SOW completed during the above time- period. The work products had included the validated programs for the DC - DC Buck Voltage Converter, the 42 Volt Lithium Polymer Battery, the 14 Volt Lead-Acid Battery, and the simplified version of the alternator subsystems as shown in Table-1 on Page 3.

6) Attachment- 6 exhibits the receipt of the Delphi check of $ 24,000 for the first SMA invoice as shown in Attachment-6. SMA will transfer the payment of the reduced amount of $ 8,000 to the second SMA invoice after fixing an error in the SMA alternator model.

7) Attachment-7, exhibits the second SMA Invoice for a payment of $ 42,400 for the work completed between April 28, 2000 and September 14, 2000. This had resulted in the development of the SMA alternator model in Program 4 and the electrical system for the 42/14 dual volt vehicle in Program 5 for a total cost of $136,850 which can be observed from the data given in Table-1. Therefore, the second SMA invoice payment of $42,400 shows a significant saving for Delphi as computed below:

Saving for Delphi = ((136,850- 42,400) / 136,850) x 100 = 69 % .

8) Attachment-8 exhibits the Saber-based alternator model, Advisor battery model, and P-Spice based DC-DC Buck converter model used by Delphi for the type of work required in the SOW of the project. SMA technical team had performed a comprehensive critical review of the above material came out with a conclusion that the Delphi programs can not be used for the modeling and simulation work, a nonlinear closed-loop control system such as the electrical system of the 42/14 volt vehicle subjected to the real-world operations involving transient as well as steady-state responses as described below:

a) Delphi's Saber based alternator model can not satisfy the SOW requirements of the project since the proposed mathematical solution assumes a number of unrealistic conditions like constant machine parameters, constant speed of the machine, constant DC bus voltage, and constant field current and ignores the dynamic control operations of the three-phase bridge rectifier and the voltage regulator during the computation of the machine currents and voltages. Thus, the Delphi solution technique used for the alternator model is valid for steady state vehicle operations like " engine idling "and " cruise control." As shown in Attachment 3a, the Delphi

machine parameters data set shown exhibits the "strong nonlinear behavior. " This indicates that the Delphi alternator model will produce wrong results for vehicle operations including starting, parking, city and highway driving with frequent speed increase and decrease actions, and random events including " load dump " and " electrical demand surges."

The Delphi test data set shown in Attachment -3b exhibits the results for the machine state variables including current, voltage, back emf, torque, hp, etc., were measured at a constant alternator speed and constant field current. This implies that the voltage regulator is no longer a closed-loop controller which is in the SOW requirements. Therefore, under the steady state operation at a constant machine speed, the Delphi alternator model using piece-wise linear machine parameters yields simulation results that agree closely with the test results given in Attachment-3b. Unfortunately, under the transient operating conditions which requires the inclusion of the nonlinear machine parameters, three-phase bridge rectifier and voltage regulator models with control modes, the Delphi alternator model can not satisfy the stringent SOW requirements.

b) The Advisor /ESS based battery model adapted by Delphi has been developed by the National Renewable Energy Laboratory (NREL). The battery model is an application of the electrical and thermal analog circuit mathematical models which are interacting dynamically with changes in the cell temperature. It can be seen in Attachment-8 that, the electrical and thermal parameters described by the analog circuit elements consisting of resistance and capacitance (R-C) elements, are treated as linear R-C elements. But the SMA validation work as demonstrated in Attachment-4 proves that the R-C elements must be defined as nonlinear elements. This is because, the SMA battery model also uses R-C elements which had been determined to be nonlinear.

Furthermore, each electrical analog circuit model and thermal analog circuit model is represented by a single cell model. This is unrealistic since a battery consists of multiple cells connected in series to generate a designated terminal voltage. The representation of a multiple-cell battery by a single cell model is wrong and will result in numerical instability problems as observed by SMA during the long-duration simulation runs in excess of 5 hours on a single-cell lead-acid battery model. The application of a data smoothing module to force the simulation results to agree with the test results under identical conditions can not be justified under no circumstances. This is because, such a modeling practice does not help in identifying modeling errors and hence degrades the computational accuracy of the model in estimating the actual values of the cell temperatures and currents. Therefore, due to the above deficiencies, the Delphi battery model can not be used in the design of a digital closed-loop controller to keep the cell currents and cell temperatures below the safe levels as stated in the SOW requirements.

c) The P-Spice based Delphi DC-DC step-down (Buck) voltage converter model and corresponding simulation results are shown in Attachment-8. The P-Spice program is an analog circuit design program widely used in industry. However, for nonlinear closed-loop control systems like the alternator and for the control of the pulse width modulation (PWM) controller, there may be a need for new models to describe the physical and operational characteristics of a component, device, controller, sensors, stabilization circuit, and electrical demand loads. In such

applications, the user may have difficulties in finding the models and /or modifying the existing models retrieve from the P-Spice library.

d) The development of a validated Saber-based Delphi electrical system model for the electrical system of the 42 /14 volt vehicle using the saber based subsystem models for the alternator, Li -Po battery, Lead- Acid battery, and DC-DC Buck voltage converter is an unwise proposal. This is because, the Delphi subsystem models given in Attachment-8 can not represent the nonlinear components andclosed-loop control operations which are in the SOW requirements established during the kickoff meeting on August 16-18, 1999.

Finally, please note the following relevant remarks:

1. SMA has achieved the primary goal of the project by developing a user-friendly innovative alternator model including nonlinearities, three-phase bridge rectifier, and voltage regulator. This is a sophisticated and novel integrated system model for the alternator that allows the simulation of the real-world vehicle operations such as starting, idling, parking, acceleration, cruising, and deceleration during the city and highway driving, hill climbing and hill descending, load dump, load demand current surge, and power factor control of the alternator to improve the engine fuel efficiency. This model is easily adaptable for the design of the power factor controller (PFC) and the integrated starter- alternator (ISA) for vehicles.

2) If Delphi plans to maintain its position as a first- tier supplier of the automotive electrical systems with high fuel-efficiency, then, the SMA computer program developed for Delphi will be a powerful analysis and design tool to advance the technical capabilities of Delphi engineers. This is demonstrated in the 400 pages of facts and figures on the final technical report written by the SMA team after the cancellation of the Delphi P.O. AES93504.

3) The total charge in the two SMA invoices exhibited in Attachments 6 and 7, is $66,400. The actual SMA estimation of the project was $196,870 as given in Table-1 on Page-3. This implies that a total Delphi payment of $ 66,400 in two SMA invoices yields a significant saving of 66 % for Delphi as shown below.

Saving for Delphi = ((196,870- 66,400) / 196,870) x 100 = 66 % .

The reduction of the estimated cost of the project from the above $196,870 to $120,000 was made under the assumption of getting some technical help from Dr. Iftikhar Khan of Delphi who had the right experience in power electronics, alternator stator and field windings, battery chemistry, and voltage regulator in vehicle applications. However, this did not happen since, following the kickoff meeting, Dr. Khan was reassigned to a different project

4) SMA had suffered business opportunity losses resulting from the stalemate due to the contractual dispute with Delphi. This is because of the following events:

a) SMA had been kept in a " idling-mode " by Delphi over a period of 6 months following the project kick-off meeting in August 16-18, 1999 in Kokoma, IN. This was caused by the late delivery of the crucial Delphi alternator design and test data sets included in Attachment-3.

b) SMA had been kept away from entering into the market by the wrongful and unethical cancellation of the Delphi P.O. AES 93504 causing a bad publicity in the market sector for the alternator based electrical system. This had been described in a letter from the Delphi management with falsified statements on the quality and quantity of the work performed by the SMA team.

Therefore, Claimant respectfully requests reversal of the Fifth Omnibus Objection as "Untimely Insufficient Documentation."

Sincerely,

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Attachments :
Attachment-1 : Delphi P.O. AES 93504.
Attachment-2 : The project kick-off meeting agenda.
Attachment-3 : Delphi test data packages delivery dates to SMA.
Attachment-4 : The final Delphi program listing and computer results delivery dates from SMA to Delphi.
Attachment-5 : The first SMA Invoice to Delphi.
Attachment-6 : The first SMA Invoice payment from Delphi to SMA.
Attachment-7 : The second SMA Invoice to Delphi which remains " unpaid. "
Attachment-8 Delphi work products related to the project.
Attachment-9 : The Invoice from Altan Eris to Yilmaz Sahinkaya for consulting work.